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(54) Abstract Title
Separating economic materials from inert waste

(57) A process and apparatus for separating economic materials from inert waste has a screen 2 for screening inert waste to remove oversized material and the screened material is passed to a pre-washer 6 for pre-soaking and for removing fines smaller than a predetermined mesh size. The pre-soaked material is passed to a washer 14 for breaking down, in water, the pre-soaked materials which are larger than the predetermined mesh size and for removing the fines in suspension and screens 20 of differing size are provided for recovering the required cleaned material. Utility may be in separating soil, sand, minerals, gravel etc. from construction or demolition site wastes.

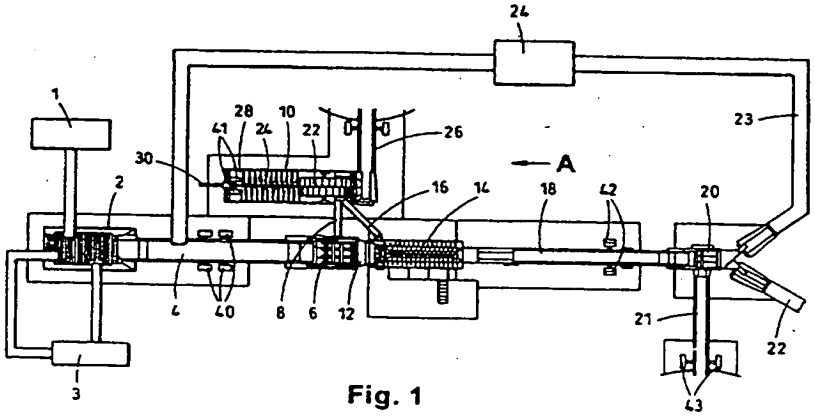

Fig. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

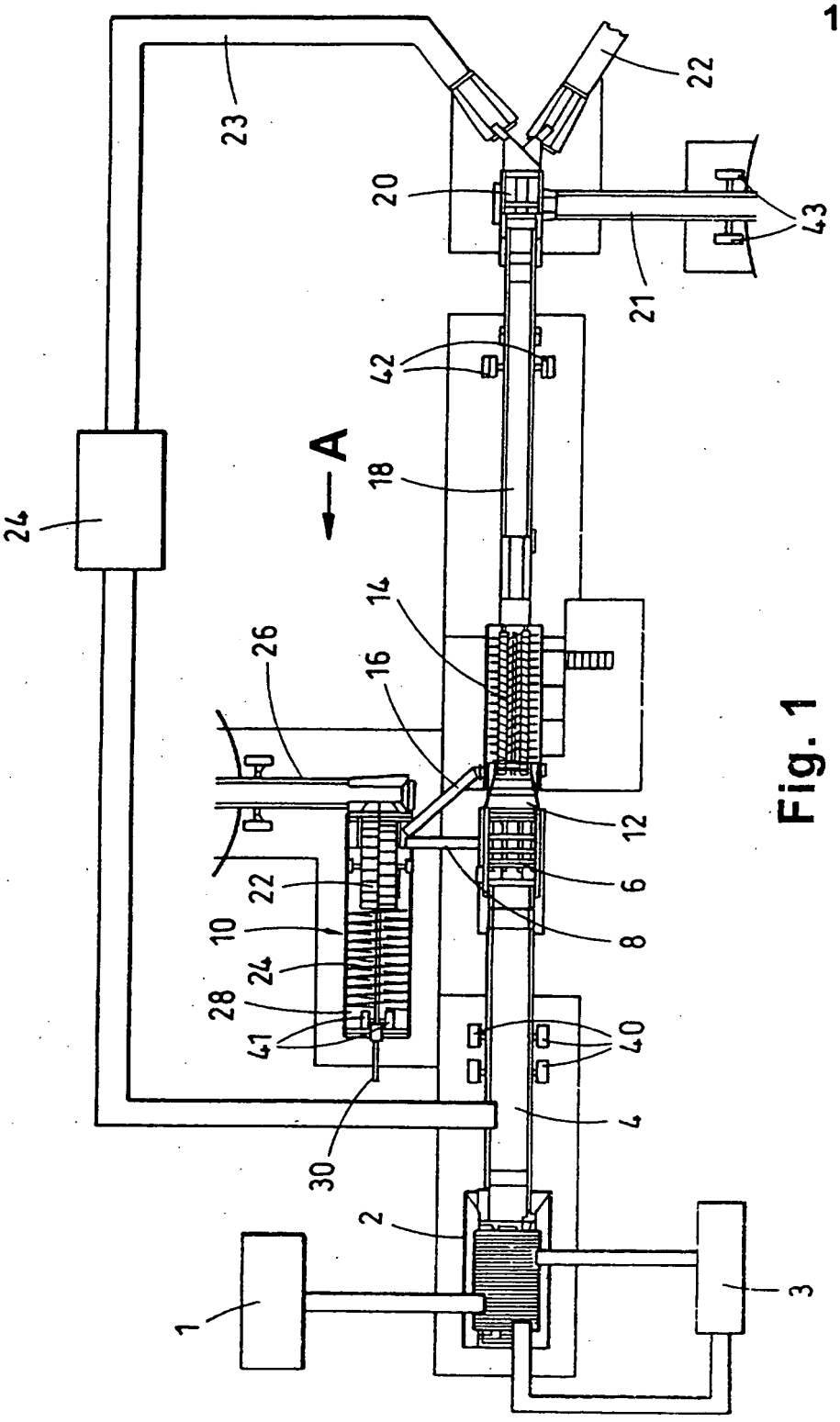

Fig. 1

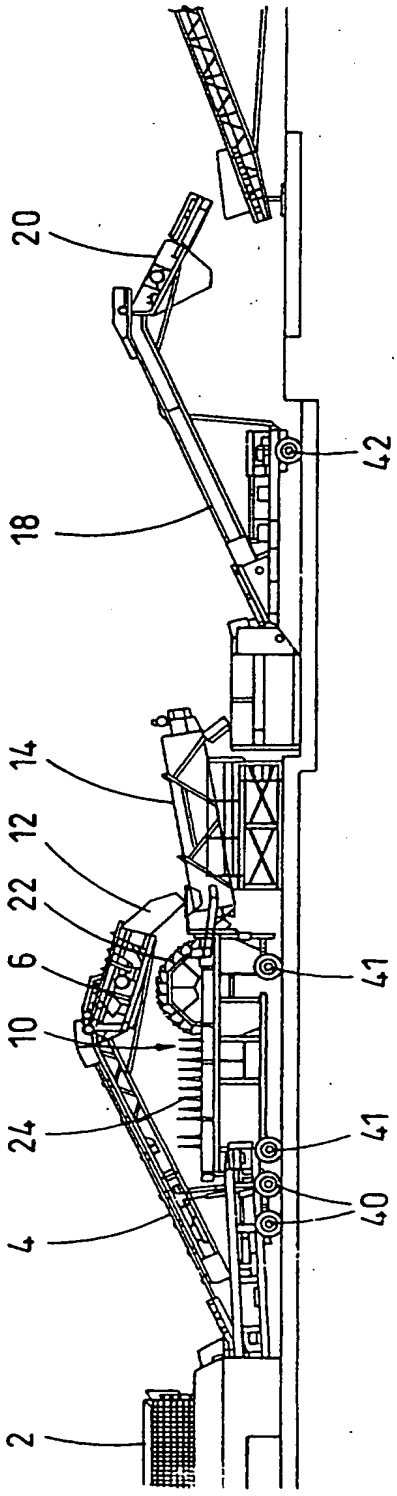

Fig. 2

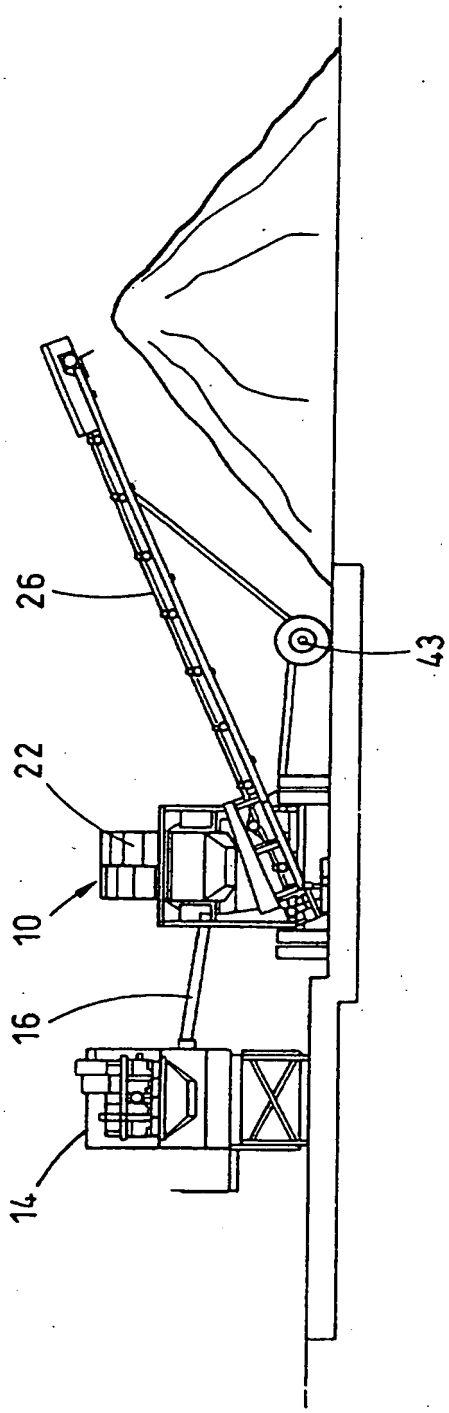

Fig. 3

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Process and apparatus for separating economic materials from inert waste.

This invention relates to the reclamation of waste material and in particular to a process and apparatus for separating economic materials from inert waste.

Recycling of materials is becoming recognised as increasingly important, both in the husbanding of resources and in the protection of the environment. To encourage recycling and protect the environment, governments are increasingly regulating and taxing the disposal of waste, and encouraging the use of recycled materials.

However, some waste materials have thus far proved impossible or uneconomic to recycle. In particular, inert waste removed from construction sites, such as clay or subsoil interspersed with stones and possibly intermixed with demolition material and rubble or oversite, has been impossible to re-use. Such waste is, therefore, suitable only for landfill, because of its inhomogeneous nature and unfavourable consistency. Disposing of such waste material is therefore a financial cost to the construction industry and to the waste disposal industry.

Such waste materials, however, do consist of a mixture of materials, such as soils, minerals, sands and gravels, which have commercial and economic value.

According to one aspect of this invention there is provided a process for separating economic materials from inert waste comprising the steps of screening inert waste to remove oversize material; passing the screened material to a pre-washing means where said screened material is pre-soaked by water jets, and fines which are smaller than a predetermined mesh size are removed in suspension; passing the pre-soaked material larger than said predetermined mesh size, to a material washer means

where the pre-soaked materials are broken down in water and fines are removed in suspension; and recovering required cleaned economic material from the material washer means.

Preferably, the water having been used in the pre-washing means, which thereby contains suspended fines, which are smaller than said predetermined mesh size, is passed to reclamation means to recover the fines.

Advantageously, the water having been used in the material washer means, which thereby contains suspended fines, is also passed to reclamation means to recover the fines.

In a preferred embodiment, the reclamation means comprises de-sanding means and settlement means.

Conveniently, the cleaned material is passed to mesh means for grading the cleaned material.

Advantageously, material buoyant in water is segregated and recovered in the reclamation means by gravitation and flotation, and, if necessary, by water jetting.

Where grossly oversized material is included in the input waste material, the process may be preceded by preliminary screening whereby the grossly oversized materials are removed by a vibrating primary scalpel means.

Advantageously, the screening of the inert waste is performed by a vibrating screen means.

Advantageously, the pre-washing means is provided with a live vibrator.

Advantageously, the material washer means is a log washer/scrubber or coarse material washer.

Preferably, water used in at least part of the process is recycled for re-use in the process.

Advantageously, the initial step of screening the inert waste by a vibrating screen removes material with a dimension greater than 80 mm.

Conveniently, the fines which are smaller than said predetermined mesh size have a maximum dimension of 5 mm; the suspended fines from the de-sanding unit have a maximum dimension of 75 micron, and the cleaned material is graded into less than 5mm, 5-20 mm, and 20-80 mm grades.

According to a further aspect of this invention, there is provided an apparatus for separating economic materials from inert waste comprising: screening means for screening inert waste to remove oversize material; pre-washing means for pre-soaking the screened material from the screening means and for removing fines smaller than a predetermined mesh size; material washer means for breaking down, in water, the pre-soaked materials which are larger than said predetermined mesh size and for removing fines in suspension; and means for recovering the required cleaned material from the material washer means.

Advantageously, reclamation means is provided to recover fines from the water used in pre-soaking in the pre-washing means.

Preferably, reclamation means is also provided to recover fines from the water used in the material washer means.

Preferably, the reclamation means includes de-sanding means, settlement means and means for recovering settled fines.

Advantageously, at least one mesh means is provided for grading the cleaned material.

Preferably, flotation and water jets means are provided in the reclamation means for segregating and recovering material buoyant in water.

Advantageously, the screening means is a vibrating screen means.

Advantageously, the pre-washing means is provided with a live vibrator.

Advantageously, the material washer means is a log washer/scrubber or coarse material washer.

Where grossly oversize materials are present in the waste material, a vibrating primary scalpel means may be provided to remove such grossly oversize materials prior to screening.

The invention will now be described by way of example, with reference to the accompanying drawing in which:

Figure 1 is a plan view of the apparatus in accordance with this invention,

Figure 2 is a side view of the apparatus shown in Figure 1,

Figure 3 is a side view, in the direction of arrow-headed line A, of the apparatus shown in Figure 1.

In the Figures, like reference numerals denote like parts.

The apparatus for separating economic materials from inert waste shown in the Figures has a live vibrating grizzly vibrating screen 2 for receiving the waste material. Such waste material may be, for example, any mixture of those uncontaminated solid wastes classified as Category 1 Wastes by the UK Environment Agency, such as subsoil, topsoil, clay, sand, stone, brickwork, concrete, road planings, pottery or china. Before screening by the vibrating screen, gross contaminates such as tree trunks, plastic piping, rocks and blocks of concrete are removed by a vibrating primary scalpel 1 and recycled or disposed of by known means, or crushed and re-introduced to the apparatus.

The vibrating screen 2 removes all material which has a dimension in excess of, for example, 80 mm from further processing, and such material in excess of 80mm is also disposed of or recycled by, for example, a crusher 3 and re-introduced to the screen 2.

Screened material below 80mm from the vibrating screen 2 is passed by a conveyor 4 to a pre-washing deck 6, having a sieve vibrated by an out of balance weight, where the material is pre-soaked by water jets to wet and wash the screened material. In this step, fines of a pre-determined size, say below 5 mm, are washed from the solid materials. These fines are passed in suspension in the washing water, along a water channel 8, to a de-sanding unit 10 and the solid materials of, for example, 5 mm to 80 mm are conveyed by a chute 12 or other means to a log washer 14.

The solids passed to the log washer 14 are aggressively scrubbed and agitated by the log washer 14 to break down remaining clay particles. Clay particles and other fines, for example, up to 2 mm are then "boiled off" by the agitation, over a weir, and passed in suspension along a second water channel 16 to the de-sanding unit 10.

The remaining cleaned solids, between, say, 5 mm and 80 mm, are then passed along a dry screen 18 from the log washer 14 to a series of meshes 20 to grade and store the material in sizes of, for example, fines less than 5mm along conveyor 21 (these fines being produced by the agression of the log washer 14 or degradation by impact of stone against stone on the screen), 5mm to 20mm along conveyor 22 and 20mm to 80mm along conveyor 23. If necessary, a rinsing deck (not shown) may be provided before the meshes.

Output from conveyor 23 is fed to a cone crusher 24 where the material is broken down and fed back to the input of the pre-washing deck 6.

The de-sanding unit 10 comprises a water wheel 22 and an Archimedes screw 24 which separate solids having a diameter greater than, say, 75 microns from the water. These solids are passed by a further conveyor 26 to a store. In addition, a flotation tank and surface water jets 28 may be provided to skim off buoyant materials such as paper, polystyrene and other plastics and these are recovered and recycled in a known manner.

Water, containing fines of diameter less than, say, 75 microns, is passed from the de-sanding unit by a water channel 30 to a settlement area (not shown) where the fines are allowed to settle, the water drained and the fines dug out for sale and re-use.

Facilities may also be provided to recover washing water used in any part of the process for re-use in the process.

It is to be understood that the screen sizes used are alterable depending upon the waste material being recovered and the apparatus may be mobile, being mounted on wheels 40 - 43 for movement about a site or to different sites.

CLAIMS:

1. A process for separating economic materials from inert waste comprising the steps of screening inert waste to remove oversize material; passing the screened material to a pre-washing means where said screened material is pre-soaked by water jets, and fines which are smaller than a predetermined mesh size are removed in suspension; passing the pre-soaked material larger than said predetermined mesh size, to a material washer means where the pre-soaked materials are broken down in water and fines are removed in suspension; and recovering required cleaned economic material from the material washer means.

2. A process as claimed in claim 1 wherein the water having been used in the pre-washing means, which thereby contains suspended fines, which are smaller than said predetermined mesh size, is passed to reclamation means to recover the fines.

3. A process as claimed in claim 1 or 2 wherein the water having been used in the material washer means, which thereby contains suspended fines, is also passed to reclamation means to recover the fines.

4. A process as claimed in claim 2 or 3 wherein the reclamation means comprises de-sanding means and settlement means.

5. A process as claimed in any preceding claim wherein the cleaned material is passed to mesh means for grading the cleaned material.

6. A process as claimed in claims 2-4 wherein material buoyant in water is segregated and recovered in the reclamation means by gravitation and flotation, and, if necessary, by water jetting.

7. A process as claimed in any preceding claim wherein where grossly oversized material is included in the input waste material, the process is preceded by preliminary screening whereby the grossly oversized materials are removed by a vibrating primary scalpel means.

8. A process as claimed in claim 7 wherein the screening of the inert waste is performed by a vibrating screen means.

9. A process as claimed in any preceding claim wherein the pre-washing means is provided with a live vibrator.

10. A process as claimed in any preceding claim wherein the material washer means is a log washer/scrubber or coarse material washer.

11. A process as claimed in any preceding claim wherein water used in at least part of the process is recycled for re-use in the process.

12. A process as claimed in claim 8 wherein the initial step of screening the inert waste by vibrating screen means removes material with a dimension greater than 80mm.

13. A process as claimed in claim 4 wherein the fines which are smaller than said predetermined mesh size have a maximum dimension of 5 mm; the suspended fines from the de-sanding means have a maximum dimension of 75 micron, and the cleaned material is graded into less than 5mm, 5-20 mm, and 20-80 mm grades.

14. An apparatus for separating economic materials from inert waste comprising: screening means for screening inert waste to remove oversize material; pre-washing means for pre-soaking the screened material from the screening means and for removing fines smaller than a predetermined mesh size; material washer means for breaking down, in water, the pre-soaked materials which are larger than said predetermined mesh size and for removing fines in suspension; and means for recovering the required cleaned material from the material washer means.

15. An apparatus as claimed in claim 14 wherein reclamation means is provided to recover fines from the water used in pre-soaking in the pre-washing means.

16. An apparatus as claimed in claim 15 wherein reclamation means is also provided to recover fines from the water used in the material washer means.

17. An apparatus as claimed in claim 15 or 16 wherein the reclamation means includes de-sanding means, settlement means and means for recovering settled fines.

18. An apparatus as claimed in claims 15-17 wherein at least one mesh means is provided for grading the cleaned material.

19. An apparatus as claimed in claims 15-18 wherein flotation and water jets means are provided in the reclamation means for segregating and recovering material buoyant in water.

20. An apparatus as claimed in claims 14-19 wherein the screening means is a vibrating screen means.

21. An apparatus as claimed in claims 14-20 wherein the pre-washing means is provided with a live vibrator.

22. An apparatus as claimed in claims 14-21 wherein the material washer means is a log washer/scrubber or coarse material washer.

23. An apparatus as claimed in claims 14-22 wherein a vibrating primary scalpel means is provided to remove oversize materials prior to screening.

24. A process substantially as herein described with reference to and as shown in the accompanying drawings.

25. An apparatus substantially as herein described with reference to and as shown in the accompanying drawings.

The Patent Office

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Claims searched: 1 - 25

Examiner: Michael R. Wendt
Date of search: 31 March 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): B03B 5/00, 7/00, 9/00, 11/00; B07B 1/55; B09B 3/00

Other: WPI, Claims, Japio

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	WPI Accession No: 97-113464/199711 & JP 090000971 A (KASHIMA) See Abstract.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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REGISTER ENTRY FOR GB2322574

Form 1 Application No GB9804032.2 filing date 25.02.1998

Priority claimed:
27.02.1997 in United Kingdom - doc: 9704087

Title PROCESS AND APPARATUS FOR SEPARATING ECONOMIC MATERIALS FROM INERT WASTE

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Title of Granted Patent PROCESS AND APPARATUS FOR SEPARATING ECONOMIC MATERIALS FROM INERT WASTE

**** END OF REGISTER ENTRY ****

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Date Next Renewal Due	25.02.2002
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New Enquiry